

OPV Series II Radio Unit Connection to GE L90 LDR (RS-422)

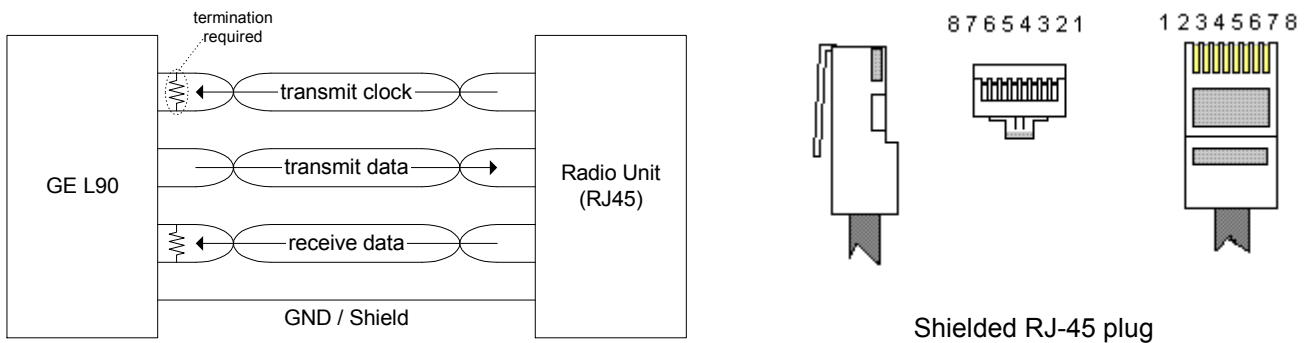
Description

To perform its protection function the General Electric L90 Line Differential Relay requires a dedicated end to end communications link. The required characteristics of this link are low delay (< 4 power system cycles round trip), minimal asymmetry (< 1ms), minimal jitter (< 0.13ms) and low error rate (10^{-6} or better). The OPV Radio Unit provides a suitable link that is RS-422 compliant.

The L90 RS-422 interface requires three signals receive data, transmit data and transmit clock. No receive clock is required as the L90 generates an internal receive clock which is synchronised to the receive bit stream. The transmit clock is 64 kHz where transmit data transitions on the falling edge.

Serial Cable Wiring

The recommended cable is shielded twisted pair similar to Belden 1868E fitted with a shielded RJ-45 plug.



The following table outlines the required connections.

GE L90 LDR Channel 1			OPV SII		
Termination (ohm)	Signal	Screw Terminal	Pin – RJ45 (male)	Signal	In / Out
none	Tx Data +	2a	2	Tx Data A	I
	Tx Data -	3b	1	Tx Data B	
N/A		N/C	6	Rx Clock A	O
		N/C	3	Rx Clock B	
100 - 150	Rx Data +	4b	5	Rx Data A	O
	Rx Data -	3a	4	Rx Data B	
100 - 150	Clock +	7a	8	Tx Clock A	O
	Clock -	8b	7	Tx Clock B	
			Body	Shield / GND	N/A
N/A	Shield	6a			
N/A	GND	8a			

Cable Termination: Although operation will not normally be prevented if the connecting cable is incorrectly terminated at the user equipment end, proper termination is strongly advised. As well as ensuring maximum signal integrity over longer cables, correct termination is necessary to ensure that compliance with CISPR22/EN55022 EMC standards is maintained.

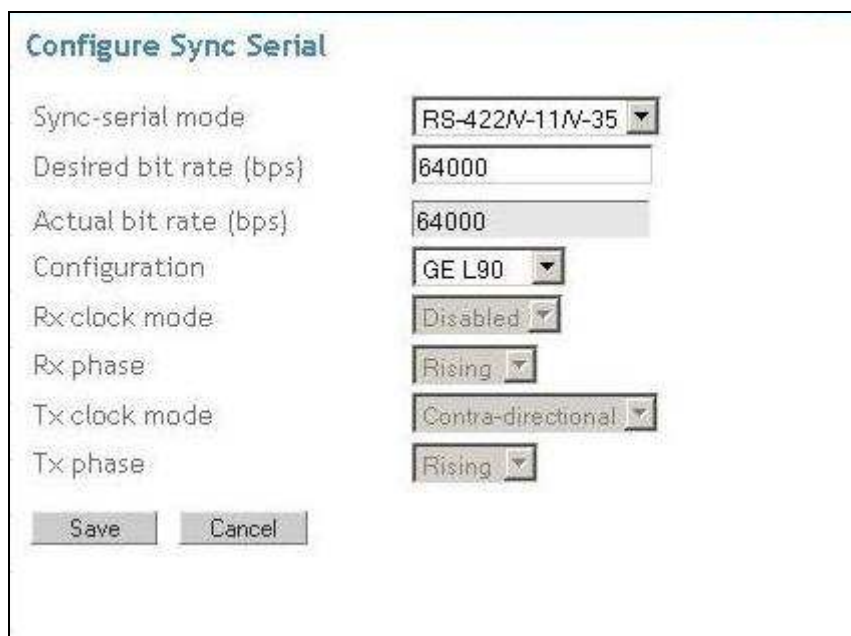
Grounding: The Synchronous Serial drive circuitry and its ground as implemented in the OPV SII is isolated from chassis ground (to 1500 VRMS). Isolation is achieved by opto-couplers for logic signals and a transformer for power. This is intended to prevent the possibility of ground loops. There is therefore a need to ground any shield at the user equipment (DTE) to prevent the shield/ground floating, however if this is impractical or otherwise undesired, provision has been made to place a shorting link between the Synchronous Serial and chassis grounds. Under NO circumstances should there be grounding at both ends (ie. The shorting link placed and a ground connection at the connected equipment).

Radio Unit Configuration

Following are the required CCMS settings. Only those applicable to L90 connection are shown and for each end are identical.

End A / End B	
CCMS – Mode Select	RS-422/V11/V35
CCMS – Desired bit rate	64000
CCMS – Configuration	GE L90

The following image is of the radio’s web page showing the application of the above settings. (Access is through the ‘Sync Serial’ tab).



L90 Status Reporting

The following image is of the PC displayed channel status page for an in service L90. Channel 2 in this case is not used and the Lost Packets is due to the L90 being operational for an extended period. (Access is through 'Actual Values' 'Status' 'Channel Tests')

Channel 1 Status	OK
Channel 1 Lost Packets	14541
Channel 1 Local Loopback Status	n/a
Channel 1 Remote Loopback Status	n/a
Channel 1 Loop Delay	20.5 ms
Channel 1 Asymmetry	0.000 ms
Channel 2 Status	n/a
Channel 2 Lost Packets	0
Channel 2 Local Loopback Status	n/a
Channel 2 Remote Loopback Status	n/a
Channel 2 Loop Delay	0.0 ms
Channel 2 Asymmetry	0.000 ms
Validity of Ch Config	n/a
PPLL Status	OK

OPV Series II to OPV Series I Adapter

When replacing a Series I radio with a Series II radio the connectors are incompatible. The following are the pin outs for a Series II to Series I cable allowing the previous cable to the L90 to be retained.

Signal	Emulated Series I Pin – DB9 (female)	Series II Pin – RJ45 (male)
Tx Data A (+)	2	2
Tx Data B (-)	7	1
Tx Clock A (+)	1	8
Tx Clock B (-)	6	7
Rx Data A (+)	4	5
Rx Data B (-)	9	4
Rx Clock A (+)	3	6
Rx Clock B (-)	8	3
Signal GND	5	N/C
Shield	Body	Body